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Center for Advanced Infrastructure & Transportation
Rutgers, The State University of New Jersey

NJDOT Bureau of Research
QUARTERLY PROGRESS REPORT

Project Title:	Monitoring of Construction Doremus Avenue Bridge Structure		
RFP NUMBER: N/A	NJDOT RESEARCH PROJECT MANAGER: W. Lad Szalaj		
TASK ORDER NUMBER: 99 / 4-26676	PRINCIPAL INVESTIGATOR: Hani Nassif		
Project Starting Date: 01/01/2001 Original Project Ending Date: 12/31/2004 Modified Completion Date: 12/31/2005	Period Covered: 1st Quarter 2005		

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Literature Search	2%	0%	100%	2%
1. Finite Element Model Development and verification (Substructure & Superstructure)	5%	5%	100%	5%
2. Develop Instrumentation Plan and Install Sensors for LMC and Stage II sensors	20%	0%	100%	20%
3. Parametric Study	15%	5%	100%	15%
4. Perform Testing of LMC layers, Stage I and II before and After LMC, Monitoring and Data Collection	20%	5%	100%	20%
5. Prepare Recommendations to Modify AASHTO's, NJDOT's and LMC Procedures	20%	10%	90%	18%
6. Comparison of Analytical and Experimental Results including LMC layer	8%	5%	95%	7.60%
7. Progress Reports	5%	5%	100%	5%
Final Report	5%	5%	60%	3%
TOTAL	100%			95.6%

Project Objectives:

The Doremus Avenue bridge structure, located in Newark, NJ, is New Jersey's initial LRFD design. The construction project will involve replacement of an existing bridge structure that primarily carries truck traffic into the State's seaport area. The main objective of the overall five-year study is to instrument, monitor and evaluate the structure during and after construction. The evaluation process aims at assessing the new AASHTO LRFD design procedures and identifying what the New Jersey Department of Transportation (NJDOT) wishes to establish as future bridge design guidelines. The instrumentation schemes will be implemented during the construction phase. This will permit measuring the "undisturbed" behavior of the bridge and establishing the structure's "finger prints" prior to traffic opening. Both the superstructure and substructure will be instrumented and monitored simultaneously.

Project Abstract:

In 2002, the American Association of State Highway Transportation Officials (AASHTO) will adopt the Load and Resistance Factored Design (LRFD) Bridge Design Specifications as the standard by which all-future bridge structures will be designed. The use of these Specifications will be mandatory for all States. New Jersey has committed to the adoption of the LRFD Specifications by January 2000. The LRFD Specifications considers the variability in the behavior of structural elements through the use of extensive statistical analyses to ascertain the behavioral variability. The LRFD Specifications continue to be refined and improved. However, many of the



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Specifications' design approaches and methodologies have been adopted with limited or virtually no experimental validation. Therefore, there is a need to validate these new design procedures and models as well as to validate the integrity of LRFD designed bridge structures.

It is anticipated that the bridge will be instrumented to monitor its performance over a period of several years (5 years). It is also envisioned that the Doremus Avenue Bridge will act as a national "test bed" for verifying certain parameters of the AASHTO LRFD Bridge Design Specifications. The following sections describe the objective, scope, and tasks involved in developing analytical models and planning instrumentation schemes and sensor locations prior to the actual construction of the Doremus Ave. Bridge. The presented plan covers the first year of the project only. However, it is expected that the study will continue to allow for instrumentation, field-testing and long term monitoring. The overall project over the five-year period will consist of three Phases as follows:

- Phase I: Bridge Modeling, Instrumentation Planning, and Coordination of Tasks.
- Phase II: Bridge Instrumentation, Testing, and Verification prior to traffic opening.
- Phase III: Bridge Testing and long-term Monitoring after traffic opening.

1. Progress this quarter by task:

A. Substructure (Drilled Shaft) Modeling:

1. Compared results from finite element model for Doremus drilled shaft with those from dynamic field tests.

B. Live Load data and WIM System

1. Compared AASHTO Girder Distribution Factors (GDF) with results from various field tests and actual truck traffic.
2. Validated the Dynamic Load Factor for continuous bridges using dynamic response from various truck types.
3. Continue to collect and download WIM system data on truck weights and classification.
4. Compared load statistics and distribution from WIM truck classification using monthly and weekly data records.
5. Processed deflection data and verified code limits.

C. Fatigue System

1. Continue to collect data from the fatigue, WIM, and long-term monitoring systems.
2. Developed a computer program based on the semi-continuum method to simulate truck load effects (e.g., stress ranges and deflections). The computer simulation program will be verified using field data measured using strain transducers.

D. Final Report

1. Writing the draft report.

2. Proposed activities for next quarter by task:

1. Finalize draft report by end of March.
2. Check truck weight data from Lane 4 and verify the need to calibrate the system in this lane.
3. Purchase wireless modem and establish cellular telephone connection.
4. Evaluate performance of sensors and check for applicable procedures to maintain sensors, data acquisition system, computers, and remote data collection, to ensure reliable long term monitoring.
5. Developing computer software to record truck Multiple Presence Statistics.

3. List of deliverables provided in this quarter by task (product date):

N/A

4. Progress on Implementation and Training Activities:

N/A



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5. Problems/Proposed Solutions:

1. A request for the telephone communication to download WIM data using cellular modem was submitted to Rutgers Purchasing. Rutgers did not approve purchase of cellular line since it is outlined as a budget item in original budget. There is a need to acquire permission of NJDOT for Rutgers Accounting and Purchasing to approve the purchase.

Total Project Budget	\$914,150
Modified Contract Amount:	
Total Project Expenditure to date	\$801,712
% of Total Project Budget Expended	88%

* These are approximate expended amounts for the project; these estimates are for reference only and should not be used for official accounting purposes. For a more accurate project accounting please review the quarterly invoice for this project.